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Docket No.: M4065.0479/P479  
(PATENT)

THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Patent Application of:  
Stephen L. Casper et al.

Art Unit: 2818

Application No.: 10/076,486

Examiner: M. Tran

Filed: February 19, 2002

Allowed: April 26, 2004

For: PROGRAMMABLE CONDUCTOR  
RANDOM ACCESS MEMORY AND  
METHOD FOR SENSING SAME

**REQUEST FOR ACKNOWLEDGEMENT OF FORMS PTO-1449**

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P.O. Box 1450  
Alexandria, VA 22313-1450

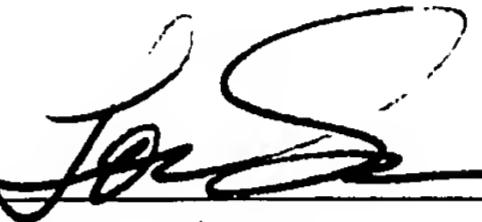
Dear Sir:

After review of the above-captioned application file after allowance, it has come to the undersigned attorneys' attention that Forms PTO-1449, which accompanied a Second Information Disclosure Statement filed September 26, 2002 and a Third Information Disclosure Statement filed September 16, 2003 have yet to be acknowledged by the Examiner. Copies of the two Information Disclosure Statements are attached

hereto, together with copies of the date-stamped postcards evidencing the filing of same. The Examiner is respectfully requested to return the initialed forms to the undersigned attorneys as soon as possible.

Dated: June 3, 2004

Respectfully submitted,

By 

Thomas J. D'Amico

Registration No. 28,371

Salvatore P. Tamburo

Registration No. 45,153

DICKSTEIN SHAPIRO MORIN &  
OSHINSKY LLP

2101 L Street NW

Washington, DC 20037-1526

(202) 785-9700

Attorneys for Applicants



Atty Docket No.. M4065.0479/P479 ✓

Inventors: Stephen L. Casper et al.

pplication No.: 10/076,486

Filing Date: February 19, 2002

title: PROGRAMMABLE CONDUCTOR RANDOM ACCESS MEMORY AND METHOD FOR  
SENSING SAME

ocuments Filed:

Second Information Disclosure Statement w/Form PTO/SB/08A and 170 references

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ender's Initials: TJD/SPT/rrl

Date: September 26, 2002



RAW 9/26/02

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Docket No.: M4065.0479/P479  
(PATENT)

**IN THE UNITED STATES PATENT AND TRADEMARK OFFICE**

In re Patent Application of:  
Stephen L. Casper et al.

Application No.: 10/076,486

Group Art Unit: 2818

Filed: February 19, 2002

Examiner: Not Known

For: **PROGRAMMABLE CONDUCTOR  
RANDOM ACCESS MEMORY AND  
METHOD FOR SENSING SAME**

**SECOND INFORMATION DISCLOSURE STATEMENT**

Commissioner for Patents  
Washington, DC 20231

Dear Sir:

Pursuant to 37 C.F.R. § 1.56, the attention of the Patent and Trademark Office is hereby directed to the documents listed on the attached PTO/SB/08. It is respectfully requested that the subject matter of the documents be expressly considered during the prosecution of this application and that the documents be made of record therein and appear among the "References Cited" on any patent to issue from this application. A copy of each document is attached.

A brief explanation of relevance of the non-patent documents listed on form PTO/SB/08 is provided and attached hereto as Appendix A. The brief explanation provided for each document is not tantamount to an admission that a document is "material" or that it qualifies as prior art. The Examiner is respectfully requested to utilize Appendix A only as a tool by which to better categorize the documents for substantive use in examining the claims of the application.

Documents discussed in Appendix A marked with an asterisk (\*) are indicated to be potentially more relevant than others. Such marking is provided only to assist the Examiner; however, the Examiner is requested to thoroughly review all documents cited herein.

In accordance with 37 C.F.R. § 1.97(g), the filing of this Second Information Disclosure Statement shall not be construed to mean that a search has been made or that no other material information as defined in 37 C.F.R. § 1.56(a) exists. It is submitted that the Second Information Disclosure Statement is in compliance with 37 C.F.R. § 1.98 and the Examiner is respectfully requested to consider and cite the listed documents.

The Commissioner is hereby authorized to charge any deficiency in the fees filed, asserted to be filed or which should have been filed herewith (or with any paper hereafter filed in this application by this firm) to our Deposit Account No. 04-1073, under Order No. M4065.0479/P479.

Dated: September 26, 2002

Respectfully submitted,

By   
Thomas J. D'Amico

Registration No. 28,371  
Salvatore P. Tamburo  
Registration No. 45,153  
DICKSTEIN SHAPIRO MORIN &  
OSHINSKY LLP  
2101 L Street, N.W.  
Washington, DC 20037-1526  
(202) 785-9700  
Attorneys for Applicant(s)

## APPENDIX A

Abdel-All, et al., Vacuum 59 (2000) 845-853: published in December, this document generally relates to, inter alia, the electrical properties of  $Ge_5As_{38}Te_{57}$  as a function of temperature.

\*Adler and Moss, J. Vac. Sci. Technol. 9 (1972) 1182-1189: this document generally relates to, inter alia, two types of electrical/material switching – threshold and memory, in amorphous materials; the effects of temperature, pressure, and frequency on switching; and the physics of threshold voltage and memory.

Adler et al., Ref. Mod. Phys. 50 (1978) 209-220: this document generally relates to, inter alia, threshold switching in amorphous alloys, state (“on” and “off”) characteristics, and glass properties.

Afifi, et al., Appl. Phys. A 55 (1992) 167-169: this document generally relates to, inter alia, SeGe-Sb glasses.

\*Afifi, et al., J. Phys. 17 (1986) 335-342: this document generally relates to, inter alia, electrical and thermal conductivity of  $Ge_xSe_{1-x}$  compositions as a function of temperature.  $Ge_{25}Se_{75}$  stoichiometry is disclosed.

Alekperova and Gadzhieva, 23 (1987) 137-139: this document generally relates to, inter alia, a characteristic diode state in  $Ag_2Se$  compositions upon heating (to 376-400°K).

\*Aleksiejunas and Cesnys, Phys. Stat. Sol. (a) 19 (1973) K169-K171: this document generally relates to, inter alia, the subjects of selenium investigation and how  $Se-Ag_2Se$  contributes silver ions to a selenium composition.

Angell, Annu. Rev. Phys. Chem. 43 (1992) 693-717: this document generally relates to, inter alia, the presence of ion conductors in solids.

Aniya, Solid State Ionics 136-137 (November 2,2000) 1085-1089: this document generally relates to, inter alia, ion conductor glasses.

Asahara and Izumitani, J. Non-Cryst. Solids 11 (1972) 97-104: this document generally relates to, inter alia, Cu-As-Se glass.

Asokan, et al., Phys. Rev. Lett. 62 (1989) 808-810: this document generally relates to, inter alia,  $Ge_xSe_{100-x}$  glasses and their transition from semiconductor-like material to metal-like material.

Baranovskii and Cordes, J. Chem. Phys. 111 (1999) 7546-7557: this document generally relates to, inter alia, ionic glasses and conduction (percolation theory).

Belin et al., Sol. St. Ionics 136-137 (November 2,2000) 1025-1029: this document generally relates to, inter alia, conductivity spectra of the glass  $0.5Ag_2S-0.5GeS_2$  and the temperature dependency of the conductivity.

Belin, et al., Solid State Ionics 143 (July 2,2001) 445-455: this document generally relates to, inter alia, the electrical properties of  $Ag_7GeSe_5I$  – an argyrodite compound.

Benmore and Salmon, Phys. Rev. Lett. 73 (1994) 264-267: this document generally relates to, inter alia, the characteristics of chalcogenide alloys.

Bernede, Thin Solid Films 70 (1980) L1-L4: this document is in the French language and the Applicant has no translation. It is presently understood to generally relate to, inter alia, metal- $Ag_2Se$ -metal sandwich devices.

Bernede, Thin Solid Films 81 (1981) 155-160: this document generally relates to, inter alia, memories of selenium alloys with metal (e.g., Ag) electrodes, where the “on” memory states require constant voltage.

Bernede, Phys. Stat. Sol. (a) 57 (1980) K101-K104: this document generally relates to, inter alia, metal-Ag<sub>2</sub>Se-P systems.

Bernede and Abachi, Thin Solid Films 131 (1985) L61-L64: this document generally relates to, inter alia, metal-insulator-metal thin films with electroforming effects; the films have silver, gold and copper electrodes.

\*Bernede, et al., Thin Solid Films 97 (1982) 165-171: this document generally relates to, inter alia, Ag<sub>2</sub>Se/Se/Metal thin film sandwiches, which were studied by shape of electrodes (e.g., symmetrical or asymmetrical).

Bernede, et al., Phys. Stat. Sol. (a) 74 (1982) 217-224: this document generally relates to, inter alia, switching in Al-Al<sub>2</sub>O<sub>3</sub>Ag<sub>2-x</sub>Se<sub>1+x</sub> devices.

Bondarev and Pikhitsa, Solid State Ionics 70/71 (1994) 72-76: this document generally relates to, inter alia, Ag<sup>(+)</sup>/RbAg<sub>4</sub>I<sub>5</sub> boundary – depletion layer, and dendritic electrodeposition.

\*Boolchand, Asian Journal of Physics (2000) 9, 709-72: this document generally relates to, inter alia, Ge<sub>x</sub>Se<sub>1-x</sub> glasses, which have selenium-rich and germanium-rich clusters, and the intrinsically-broken bond characteristics thereof.

\*Boolchand and Bresser, Nature 410 (2001) 1070-1073: published April 26, this document generally relates to, inter alia, Ag<sub>2</sub>Se as an electrolyte additive to glass, e.g., GeSe<sub>4</sub>. Ge<sub>30</sub>Se<sub>70</sub> glass was found not to work well because of Ag<sub>2</sub>Se crystallization.

\*Boolchand, et al., J. Optoelectronics and Advanced Materials, 3 (September 2001), 703: this document generally relates to, inter alia, a review of Raman tool scattering of chalcogenide glasses. The floppyness and rigidness is observed.  $Ge_xSe_{1-x}$  is disclosed, as is a stoichiometry of  $Ge_{25}Se_{75}$ .

Boolchand and Grothaus, Eds. Chadi and Harrison, Proc. Int. Conf. Phys, Semicond., 17<sup>th</sup> (1985) 833-36: this document generally relates to, inter alia, GeSe and GeS glasses and the importance of a broken chemical order therein.

\*Boolchand, et al., Properties and Applications of Amorphous Materials, M.F. Thorpe and Tichy, L. (eds.) Kluwer Academic Publishers, the Netherlands, 2001, pp. 97-132: this document generally relates to, inter alia, the prediction of glass rigidity in  $Ge_xSe_{1-x}$  glass, e.g.,  $Ge_{23}Se_{77}$ .

\*Boolchand, et al., Diffusion and Defect Data, Vol. 53-54 (1987) 415-420: this document generally relates to, inter alia, thermal annealing of  $Ge_xSe_{1-x}$  films.

\*Boolchand, et al., Phys. Rev. B 25 (1982) 2975-2978: this document generally relates to, inter alia, the examination of GeSe glass having Sn impurities by Mossbauer spectroscopy. Investigations into glass network topology, which has an intrinsically broken bond backbone, suggesting Ge and Se rich clusters.

Boolchand, et al., Sol. State Comm. 45 (1983) 183-185: this document generally relates to, inter alia,  $Ge_xSe_{1-x}$  and  $Ge_xS_{1-x}$  glasses.

\*Boolchand and Bresser, Dep. Of ECECS, Univ. Cincinnati 45221-0030: this document generally relates to, inter alia,  $Ge_xSe_{1-x}$  and the relation of glass transition temperature to Ge concentration in backbone. Although the publication date of this reference is not known to the Applicant, it was revised October 28, 1999 and is believed to

be publicly available at the University of Cincinnati, Department of Electrical and Computer Engineering and Computer Science.

Bresser, et al., Phys. Rev. Lett. 56 (1986) 2493-2496: this document generally relates to, inter alia, an investigation of c-GeSe<sub>2</sub> structure.

Bresser, et al., J. de Physique 42 (1981) C4-193-C4-196: this document generally relates to, inter alia, the characteristics of GeSe<sub>2</sub> and GeS<sub>2</sub> glasses.

Bresser, et al., Hyperfine Interactions 27 (1986) 389-392: this document generally relates to, inter alia, germanium selenide glasses doped with tellurium.

Cahen, et al., Science 258 (1992) 271-274: this document generally relates to, inter alia, chalcopyrite CuInSe<sub>2</sub> glasses.

Chatterjee, et al., J. Phys. D: Appl. Phys. 27 (1994) 2624-2627: this document generally relates to, inter alia, As<sub>x</sub>Te<sub>100-x-y</sub>Se<sub>y</sub> glasses and the current, voltage, and electrical switching behavior. Discloses applicability in read mostly memories.

\*Chen and Tai, Appl. Phys. Lett. 37 (1980) 1075-1077: this document generally relates to, inter alia, silver photodoping of Ge<sub>x</sub>Se<sub>1-x</sub> and whisker formation (crystalline Ag<sub>2</sub>Se).

Chen and Cheng, J. Am. Ceram. Soc. 82 (1999) 2934-2936: this document generally relates to, inter alia, germanium containing chalcogenides doped with Si<sub>3</sub>N<sub>4</sub>.

Chen, et al., J. Non-Cryst. Solids 220 (1997) 249-253: this document generally relates to, inter alia, As<sub>10</sub>Ge<sub>30</sub>Se<sub>60</sub> glasses (and the like) doped with Si<sub>3</sub>N<sub>4</sub>.

Cohen, et al., J. Non-Cryst. Solids 8-10 (1972) 885-891: this document generally relates to, inter alia, Ge-Te-X glasses as memory devices.

Croitoru, et al., J. Non-Cryst. Solids 8-10 (1972) 781-786: this document generally relates to, inter alia, the physics of conductivity in Ge-containing films.

Dalven and Gill, J. Appl. Phys. 38 (1967) 753-756: this document generally relates to, inter alia, beta-Ag<sub>2</sub>Te.

Davis, Search 1 (1970) 152-155: this document generally relates to, inter alia, the subject of amorphous semiconductors as compared to glass.

\*Dearnaley, et al., Rep. Prog. Phys. 33 (1970) 1129-1191: this document generally relates to, inter alia, background information about glass and memory.

\*Dejus, et al., J. Non-Cryst. Solids 143 (1992) 162-180: this document generally relates to, inter alia, Ag-Ge-Se glass with Ag primarily bonded to Se. The reference discloses glass preparation.

den Boer, Appl. Phys. Lett. 40 (1982) 812-813: this document generally relates to, inter alia, a-Si:H sandwich structures and threshold switching from a low to high conductance.

Drusdau, et al., J. Non-Cryst. Solids 198-200 (1996) 829-832: this document generally relates to, inter alia, work with a-Si:H multilayers optoelectrical properties.

El Bouchairi, et al., Thin Solid Films 110 (1983) 107-113: this document generally relates to, inter alia, Ag<sub>2-x</sub>Se<sub>1+x</sub> thin film electrical characteristics and metal-like conduction.

El Ghraras, et al., J. Non-Cryst. Solids 155 (1993) 171-179: this document generally relates to, inter alia, photoconductivity of amorphous Se and Ge-Se alloy evaporated films, and reduction of photocurrent by increase of Ge content.

\*El Ghrandi, et al., *Thin Solid Films* 218 (1992) 259-273: this document generally relates to, *inter alia*, GeSe films deposited by PECVD, Ag evaporation deposition onto glass and photodissolution into same, and optical properties are investigated. GeSe stoichiometries of 30/70 and 25/75, respectively, are disclosed.

\*El Ghrandi, et al., *Phys. Stat. Sol. (a)* 123 (1991) 451-460: this document generally relates to, *inter alia*, dissolution of Ag into GeSe<sub>5.5</sub> glass by flash evaporation.

El-kady, *Indian J. Phys.* 70 A (1996) 507-516: this document generally relates to, *inter alia*, Ge<sub>21</sub>Se<sub>17</sub>Te<sub>62</sub> glass and memory, switching, and current controlled negative resistance.

Elliott, *J. Non-Cryst. Solids* 130 (1991) 85-97: this document generally relates to, *inter alia*, mechanisms of photodissolution of metals (e.g., Ag) in chalcogenides based on ionic and electronic charge carriers.

\*Elliott, *J. Non-Cryst. Sol.* 130 (1991) 1031-1034: this document generally relates to, *inter alia*, the photodissolution of metals (e.g., Ag) in chalcogenide glasses and the physics thereof.

Elsamanoudy, et al., *Vacuum* 46 (1995) 701-707: this document generally relates to, *inter alia*, studies of quaternary chalcogenide films with Te-As-Ge-Si sandwich structures between electrodes.

\*El-Zahed and El-Korashy, *Thin Solid Films* 376 (November 1, 2000) 236-240: this document generally relates to, *inter alia*, Ge<sub>20</sub>Bi<sub>x</sub>Se<sub>80-x</sub> film analysis regarding conduction and changes from p to n type.

Fadel, *Vacuum* 44 (1993) 851-855: this document generally relates to, *inter alia*, a study of the switching and memory characteristics of Se<sub>75</sub>Ge<sub>25-x</sub>As<sub>x</sub> films.

\*Fadel and El-Shair, Vacuum 43 (1992) 253-257: this document generally relates to, inter alia,  $\text{Se}_{75}\text{Ge}_7\text{Sb}_{18}$  glass electrical conduction and thermal character.

Feng, et al., Phys. Rev. Lett. 78 (1997) 4422-4425: this document generally relates to, inter alia, germanium selenide and germanium sulfide materials.

\*Feng, et al., J. Non-Cryst. Solids 222 (1997) 137-143: this document generally relates to, inter alia, the structural character of  $\text{Ge}_x\text{S}_{1-x}$  glass, e.g., hardness and elasticity.

\*Fischer-Colbrie, et al., Phys. Rev. B 38 (1988) 12388-12403: this document generally relates to, inter alia, photodiffused  $\text{Ag}-\text{GeSe}_2$  and the interaction between doped Ag with Se atoms and Ge with Ge atoms.

Fleury, et al., Phys. Stat. Sol. (a) 64 (1981) 311-316: this document generally relates to, inter alia, amorphous selenium films and their conductance.

Fritzsche, J. Non-Cryst. Sol. 6 (1971) 49-71: this document generally relates to, inter alia, background information on chalcogenides as semiconductors.

Fritzsche, Annual Review of Mat. Sci. 2 (1972) 697-744: this document generally relates to, inter alia, background information on amorphous semiconductors.

Gates, et al., J. Am. Chem. Soc. (2001): this document generally relates to, inter alia, creating  $\text{Ag}_2\text{Se}$  nanowires by chemical reaction.

Gosain, et al., Jap. J. Appl. Phys. 28 (1989) 1013-1018: this document generally relates to, inter alia, germanium telluride glasses sandwiched in electrodes and the physics thereof.

\*Guin et al., J. Non-Cryst. Sol. 298 (March 28, 2002) 260-269: this document generally relates to, inter alia, germanium selenide ( $\text{GeSe}$ ) glass with low hardness, the

mechanical properties of which are investigated. Stoichiometries of the glass are disclosed as being, inter alia, 10/90, 20/80, and 30/70, respectively.

\*Guin et al., J. Am. Ceram. Soc. 85 (June 2002) 1545-1552: this document generally relates to, inter alia, germanium selenide glasses and a study of the hardness properties thereof. Glass stoichiometries of 40/60 and 20/80, respectively, are disclosed.

Gupta, J. Non-Cryst. Sol. 3 (1970) 148-154: this document generally relates to, inter alia, switching in chalcogenides.

Haberland and Stiegler, J. Non-Cryst. Solids 8-10 (1972) 408-414: this document generally relates to, inter alia, glasses containing Te, As, Ge, and Si, and pulse sequence and time factors in switching.

Haifz, et al., J. Apply. Phys. 54 (1983) 1950-1954: this document generally relates to, inter alia, As-Se-Cu glasses.

Hajto, et al., Int. J. Electronics 73 (1992) 911-913: this document generally relates to, inter alia, metal/a-Si:H/metal devices.

Hajto, et al., J. Non-Cryst. Solids 266-269 (May 1,2000) 1058-1061: this document generally relates to, inter alia, a-Si:H ion conductors, polarity-dependant digital and analogue memory, and dependency on contact metals.

Hajto, et al., J. Non-Cryst. Solids 198-200 (1996) 825-828: this document generally relates to, inter alia, electroformed V/a-Si:H/Cr devices.

Hajto, et al., Phil. Mag. B 63 (1991) 349-369: this document generally relates to, inter alia, p+ type amorphous Si memory structures with polarity dependent analogue switching.

Hayashi, et al., Japan. J. Appl. Phys. 13 (1974) 1163-1164: this document generally relates to, inter alia, Au-CdS(CdSe)-Au systems and metal-Se-Sn-SnO<sub>2</sub> systems.

\*Hegab, et al., Vacuum 45 (1994) 459-462: this document generally relates to, inter alia, Ge<sub>20</sub>M<sub>75</sub>Sb<sub>18</sub> glass electrical conduction and thermal character.

Hirose and Hirose, J. Appl. Phys. 47 (1976) 2767-2772: this document generally relates to, inter alia, Ag photodoped As<sub>2</sub>S<sub>3</sub>, polarized switching, and dendrite formation.

Hong and Speyer, J. Non-Cryst. Solids 116 (1990) 191-200: this document generally relates to, inter alia, Cd-Ge-As glass with Ag contacts.

Hosokawa, J. Optoelectronics and Advanced Materials 3 (2001) 199-214: this document generally relates to, inter alia, x-ray scattering experiments on glassy Ge<sub>x</sub>Se<sub>1-x</sub>.

Hu, et al., J. Non-Cryst. Solids 227-230 (1998) 1187-1191: this document generally relates to, inter alia, a-Si:H with Cr and V electrodes.

Hu, et al., Phil. Mag. B. 74 (1996) 37-50: this document generally relates to, inter alia, a-Si:H glasses doped with Cr and analogue memory.

Hu, et al., Phil. Mag. B 80 (January 1, 2000) 29-43: this document generally relates to, inter alia, a-Si:H films doped with Cr-p+.

Iizima, et al., Solid State Comm. 8 (1970) 153-155: this document generally relates to, inter alia, switching and memory effects in As-Te-I<sup>1,2</sup> and As-Te-Ge-Si<sup>3</sup> glass systems. Thermal breakdown is proposed switching effect.

Ishikawa and Kikuchi, J. Non-Cryst. Solids 35 & 36 (1980) 1061-1066: this document generally relates to, inter alia, Ge<sub>2</sub>S<sub>2</sub> films with Ag photodissolved therein.

\*Iyetomi, et al., J. Non-Cryst. Solids 262 (February 2000) 135-142: this document generally relates to, inter alia, Ag/Ge/Se glasses as a composite of GeSe<sub>2</sub> and Ag<sub>2</sub>Se (a fast ion conductor) and polarizability of Se ions.

Jones and Collins, Thin Solid Films 40 (1977) L15-L18: this document generally relates to, inter alia, switching in Se films and switching back with reverse pulse.

Joullie and Marucchi, Phys. Stat. Sol. (a) 13 (1972) K105-K109: this document generally relates to, inter alia, As<sub>2</sub>Se<sub>3</sub> glass.

Joullie and Marucchi, Mat. Res. Bull. 8 (1973) 433-442: this document generally relates to, inter alia, As<sub>2</sub>Se<sub>5</sub> film conduction and switching.

Kaplan and Adler, J. Non-Cryst. Solids 8-10 (1972) 538-543: this document generally relates to, inter alia, thermal effects on semiconductor switching.

\*Kawaguchi, et al., J. Appl. Phys. 79 (1996) 9096-9104: this document generally relates to, inter alia, Ag-rich chalcogenide glass, Ge<sub>3</sub>S<sub>7</sub>-Ag and Ge<sub>30</sub>Se<sub>70</sub>-Ag, max Ag content of 67%, graphs phase diagram, and discloses that Ag works better than Cu.

\*Kawaguchi and Masui, Jpn. J. Appl. Phys. 26 (1987) 15-21: this document generally relates to, inter alia, silver photodoping of chalcogenide films, e.g., Ge<sub>30</sub>Se<sub>70</sub> films.

\*Kawasaki, et al., Solid State Ionics 123 (1999) 259-269: this document generally relates to, inter alia, the electrical properties of Ag<sub>x</sub>(GeSe<sub>3</sub>)<sub>1-x</sub>, conductivity EMF measurements, glass composition, X-ray diffraction, T<sub>g</sub> and T<sub>c</sub>, Ag ion transport, and glass structure.

\*Kluge, et al., J. Non-Cryst. Solids 124 (1990) 186-193: this document generally relates to, inter alia, photodiffusion of silver into Ge<sub>x</sub>Se<sub>100-x</sub> layers, how this differs from ion beam induced diffusion, Ge<sub>30</sub>Se<sub>70</sub> stoichiometry, Ag<sub>2</sub>Se, and percolation threshold.

\*Kolobov, J. Non-Cryst. Solids 198-200 (1996) 728-731: this document generally relates to, inter alia, p-type conductive chalcogenides, materials, and physics thereof.

\*Kolobov, J. Non-Cryst. Solids 137-138 (1991) 1027-1030: this document generally relates to, inter alia, doped and undoped glass layers as a p-n junction.

Korkinova and Andreichin, J. Non-Cryst. Solids 194 (1996) 256-259: this document generally relates to, inter alia, polarization of chalcogenide glass as depending on the materials used for electrode contacts.

\*Kotkata, et al., Thin Solid Films 240 (1994) 143-146: this document generally relates to, inter alia, GeSe glass switching and film thickness, memory, current filament, chemical and mechanical switching properties, and discloses that heat treatment or aging improves switching.

Lakshminarayan, et al., J. Instn. Electronics & Telecom. Engrs. 27 (1981) 16-19: this document generally relates to, inter alia, tellurium-containing chalcogenide glasses.

Lal and Goyal, Indian Journal of Pure & Appl. Phys. 29 (1991) 303-304: this document generally relates to, inter alia, theory on chalcogenide switching.

\*Leimer et al., Phys. Stat. Sol. (a) 29 (1975) K129-K132: this document generally relates to, inter alia, germanium selenide glass polarization behavior, e.g., inductive and capacitive components.

\*Leung, et al., Appl. Phys. Lett. 46 (1985) 543-545: this document generally relates to, inter alia, photoinduced diffusion of Ag into  $Ge_xSe_{1-x}$  and techniques for same.

Matsushita, et al., Jap. J. Appl. Phys. 11 (1972) 1657-1662: this document generally relates to, inter alia,  $Se-SnO_2$  film switching and reversibility.

Matsushita, et al., Jpn. J. Appl. Phys. 11 (1972) 606: this document generally relates to, inter alia, polarized memory effect in Se films.

Mazurier, et al., Journal de Physique IV 2 (1992) C2-185 - C2-188: this document generally relates to, inter alia, Te-based glasses.

Messoussi, et al., Mat. Chem. And Phys. 28 (1991) 253-258: this document generally relates to, inter alia, selenium films and Bi electrodes.

\*Mitkova and Boolchand, J. Non-Cryst. Solids 240 (1998) 1-21: this document generally relates to, inter alia, the analysis of Group IV and V chalcogenides.

\*Mitkova and Kozicki, J. Non-Cryst. Solids 299-302 (May 14, 2002) 1023-1027: this document generally relates to, inter alia, photodissolution of Ag into Se-rich Ge-Se glasses for use in memory devices. The information disclosed in this reference was available to and known by the inventors prior to the filing of the application.

\*Mitkova, et al., Phys. Rev. Lett. 83 (1999) 3848-3851: this document generally relates to, inter alia, Ag doped chalcogenides,  $Ge_{20}Se_{80}$  stoichiometry is disclosed, Se rich glasses, Ge rich glasses, stoichiometric glasses, and presence of  $Ag_2Se$ .

\*Miyatani, J. Phys. Soc. Japan 34 (1973) 423-432: this document generally relates to, inter alia, electrical and ionic properties of solid solutions (e.g., doped glass), polarization, conductivity,  $Ag_2Se$  and  $Cu_2Se$ .

Miyatani, J. Phys. Soc. Japan 13 (1958) 317: this document generally relates to, inter alia, experiments regarding the electronic conductivity, ionic conductivity, hall constant, thermoelectric power, and Nernst coefficient of  $Ag_2Se$  as function of the e.m.f., E, the galvanic cell, or the deviation from stoichiometric composition.

\*Miyatani, J. Phys. Soc. Japan 14 (1959) 996-1002: this document generally relates to, inter alia,  $\text{Ag}_2\text{Te}$  and  $\text{Ag}_2\text{Se}$  ion conduction and the chemical potential of silver ions.

Mott, J. Non-Cryst. Sol. 1 (1968) 1-17: this document generally relates to, inter alia, glasses with vanadium or iron.

\*Nakayama, et al., Jpn. J. Appl. Phys. 32 (1993) 564-569: this document generally relates to, inter alia, electrically erasable nonvolatile memories in chalcogenide films of  $\text{As}_x\text{Sb}_y\text{Te}_z$ , flash evaporative deposition techniques, a high set-voltage compared to read-voltage,  $V_t$ , creates a “filament,” and refresh-type pulse.

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\*Neale and Aseltine, , IEEE Transactions On Electron Dev. Ed-20 (1973) 195-209: this document generally relates to, inter alia, read mostly memories with chalcogenides (e.g., Ge, Te), also discloses “floating gate,” and material combinations including Ge and Se.

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\*Owen, et al., Int. J. Electronics 73 (1992) 897-906: this document generally relates to, inter alia, threshold and memory switching a-Si:H ion conductor, polarity-dependant digital memory, analogue memory, and device operation dependency on metal contacts.

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\*Prakash, et al., J. Phys. D: Appl. Phys. 29 (1996) 2004-2008: this document generally relates to, inter alia, switching of  $Ge_{10}As_{45}Te_{45}$  glass, study of threshold voltage concept and switch back to off, suitability for read mostly memory.

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\*Thornburg, J. Elect. Mat. 2 (1973) 3-15: this document generally relates to, inter alia, division of chalcogenides into stoichiometric compounds with no changes upon crystallization, stoichiometric compounds with changes upon crystallization, and non-stoichiometric which phase separate on crystallization,  $As_2Se$ , and filament growth as a function of bias applied.

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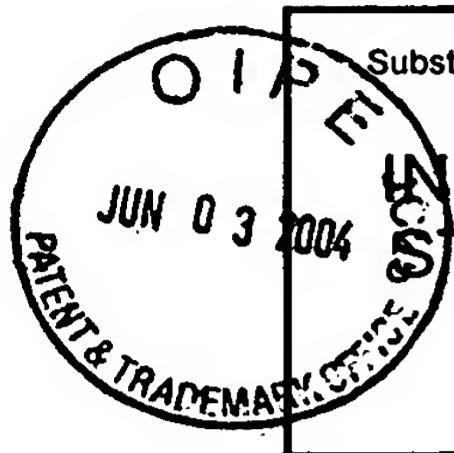
Weirauch, App. Phys. Lett. 16 (1970) 72-73: this document generally relates to, inter alia, chalcogenide device resistively changes in high electric fields.

\*West, et al., J. Electrochem. Soc. 145 (1998) 2971-2974: this document generally relates to, inter alia, Ag/As<sub>24</sub>S<sub>36</sub>Ag<sub>40</sub>/Ag systems and Ag transport.

\*West, Ph.D. Dissertation, ASU 1998: this document generally relates to, inter alia, metal dendrite memory with Ag or Cu doped solid electrolyte, photodissolution of Ag into As<sub>2</sub>S<sub>3</sub> glass, lateral devices with silver electrodes, vertical devices with Ag electrodes, write voltages and lesser read voltages, and pinpoint electrode surrounded by ring electrode. Although the exact publication date for this document is not known, it is believed to be available at Arizona State University.

Zhang, et al., J. Non-Cryst. Solids 151 (1992) 149-154: this document generally relates to, inter alia, T<sub>g</sub> investigation for glasses.

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Substitute for form 1449A/PTO				<b>Complete If Known</b>	
				Application Number	10/076,486
				Filing Date	February 19, 2002
				First Named Inventor	Stephen L. Casper
				Art Unit	2818
				Examiner Name	Not Known
Sheet	1	of	8	Attorney Docket Number	M4065.0479/P479

<b>U.S. PATENT DOCUMENTS</b>					
Examiner Initials*	Cite No. <sup>1</sup>	Document Number	Publication Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Document	Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear
		Number-Kind Code <sup>2</sup> (if known)			
AA	6,388,324		05/14/2002	Kozicki et al.	
AB	US 2002/0000666		01/03/2002	Kozicki et al.	
AC	5,500,532		03/19/1996	Kozicki et al.	
AD	6,418,049		07/09/2002	Kozicki et al.	
AE	5,751,012		05/12/1998	Wolstenholme et al.	
AF	5,789,277		08/04/1998	Zahorik et al.	
AG	6,348,365		02/19/2002	Moore et al.	

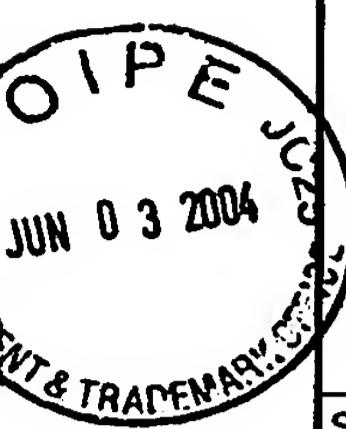
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Examiner Initials*	Cite No. <sup>1</sup>	Foreign Patent Document	Publication Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Document	Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear
		Country Code <sup>3</sup> -Number <sup>4</sup> -Kind Code <sup>5</sup> (if known)			
BA	WO 02/21542		03/14/2002	Kozicki et al.	
BB	WO 00/48196		08/17/2000	Kozicki et al.	
BC	WO 97/48032		12/18/1997	Kozicki et al.	
BD	WO 99/28914		06/10/1999	Kozicki et al.	

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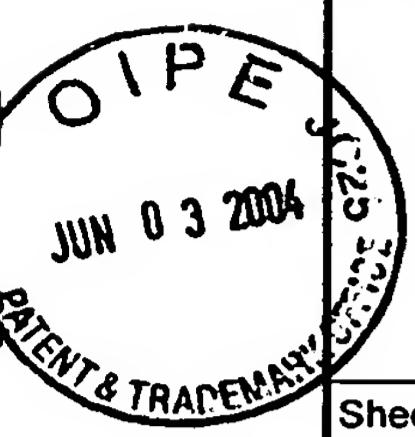
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Substitute for form 1449B/PTO  <b>INFORMATION DISCLOSURE STATEMENT BY APPLICANT</b>  (use as many sheets as necessary)				<b>Complete If Known</b>	
Sheet	2	of	8	Application Number	10/076,486
				Filing Date	February 19, 2002
				First Named Inventor	Stephen L. Casper
				Group Art Unit	2818
				Examiner Name	Not Known
				Attorney Docket Number	M4065.0479/P479

<b>OTHER PRIOR ART – NON PATENT LITERATURE DOCUMENTS</b>				
Examiner Initials	Cite No. <sup>1</sup>	Include name of the author (in CAPITAL LETTERS), title of the article (when appropriate), title of the item (book, magazine, journal, serial, symposium, catalog, etc), date, page(s), volume-issue number(s), publisher, city and/or country where published.		T <sup>2</sup>
	CA	Abdel-All, A.; Elshafie, A.; Elhawary, M.M., DC electric-field effect in bulk and thin-film Ge5As38Te57 chalcogenide glass, Vacuum 59 (2000) 845-853.		
	CB	Adler, D.; Moss, S.C., Amorphous memories and bistable switches, J. Vac. Sci. Technol. 9 (1972) 1182-1189.		
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	CF	Alekperova, Sh.M.; Gadzhieva, G.S., Current-Voltage characteristics of Ag2Se single crystal near the phase transition, Inorganic Materials 23 (1987) 137-139.		
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Sheet

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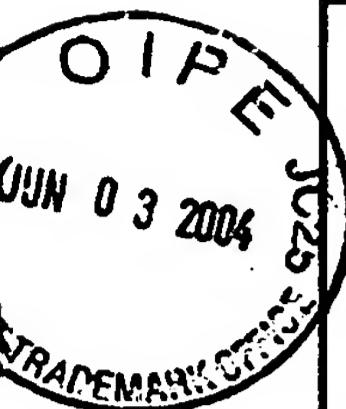
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Complete If Known	
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First Named Inventor	Stephen L. Casper
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Attorney Docket Number	M4065.0479/P479

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CQ1	Davis, E.A., Semiconductors without form, Search 1 (1970) 152-155.
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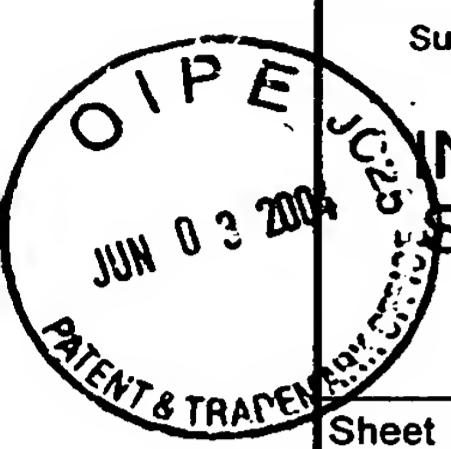
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				Application Number	10/076,486
				Filing Date	February 19, 2002
				First Named Inventor	Stephen L. Casper
				Group Art Unit	2818
				Examiner Name	Not Known
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Application Number

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First Named Inventor

Stephen L. Casper

Group Art Unit

2818

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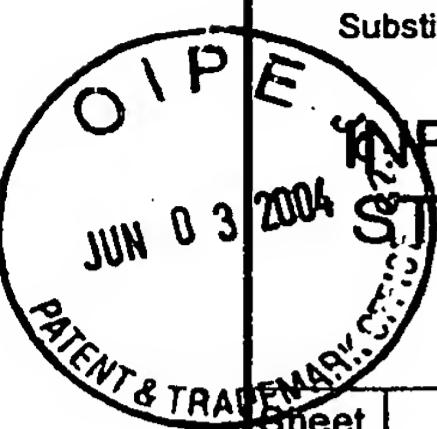
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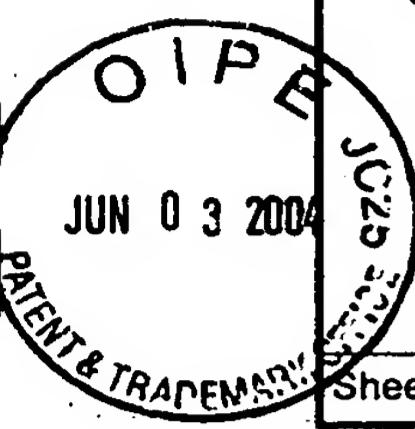
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				Group Art Unit	2818
				Examiner Name	Not Known
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Examiner Signature	Date Considered
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<sup>1</sup>Applicant's unique citation designation number (optional). <sup>2</sup>Applicant is to place a check mark here if English language Translation is attached.



Inventors: Stephen L. Casper et al.

Atty Docket No.: M4065.0479/P479

Application No.: 10/076,486

Title: PROGRAMMABLE CONDUCTOR RANDOM ACCESS MEMORY AND METHOD FOR  
SENSING SAME

**Documents Filed:**

Amendment w/copies 1449 and two date-stamped postcards  
Third IDS w/Appendix A, PTO/SB/08A and 79 references  
Form PTO-2038  
Amendment Transmittal

Via: PTO Daily Run  
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Filing Date: February 19, 2002

Date: September 16, 2002



D.W.



Docket No.: M4065.0479/P479  
(PATENT)

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Patent Application of:  
Stephen L. Casper et al.

Application No.: 10/076,486

Group Art Unit: 2818

Filed: February 19, 2002

Examiner: M. Tran

For: PROGRAMMABLE CONDUCTOR  
RANDOM ACCESS MEMORY AND  
METHOD FOR SENSING SAME

**THIRD INFORMATION DISCLOSURE STATEMENT**

Commissioner for Patents  
Washington, DC 20231

Dear Sir:

Pursuant to 37 C.F.R. § 1.56, the attention of the Patent and Trademark Office is hereby directed to the documents listed on the attached PTO/SB/08. It is respectfully requested that the subject matter of the documents be expressly considered during the prosecution of this application and that the documents be made of record therein and appear among the "References Cited" on any patent to issue from this application. A copy of each document is attached.

This Third Information Disclosure Statement is being filed concurrently with an Amendment.

A brief explanation of relevance of certain non-patent documents listed on Form PTO/SB/08 is provided and attached hereto as Appendix A. The brief explanation provided for each document is not tantamount to an admission that a document is "material" or that it qualifies as prior art. The Examiner is respectfully requested to utilize

Appendix A only as a tool by which to better categorize the documents for substantive use in examining the claims of the application.

Documents discussed in Appendix A marked with an asterisk (\*) are indicated to be potentially more relevant than others. Such marking is provided only to assist the Examiner; however, the Examiner is requested to thoroughly review all documents cited herein.

In accordance with 37 C.F.R. § 1.97(g), the filing of this Third Information Disclosure Statement shall not be construed to mean that a search has been made or that no other material information as defined in 37 C.F.R. § 1.56(a) exists. It is submitted that this Third Information Disclosure Statement is in compliance with 37 C.F.R. § 1.98 and the Examiner is respectfully requested to consider and cite the listed documents.

The Director is hereby authorized to charge the \$180.00 fee as required by 37 C.F.R. §1.17(p) to the undersigned attorneys' credit card. Form PTO-2038 is attached. The Commissioner also is authorized to charge any deficiency in the fees filed, asserted to be filed, or which should have been filed herewith (or with any paper hereafter filed in this application by this firm), to our Deposit Account No. 04-1073, under Order No. M4065.0479/P479.

Dated: September 16, 2003

Respectfully submitted,

By   
\_\_\_\_

Thomas J. D'Amico  
Registration No. 28,371  
Salvatore P. Tamburo  
Registration No. 45,153  
DICKSTEIN SHAPIRO MORIN &  
OSHINSKY LLP  
2101 L Street, N.W.  
Washington, DC 20037-1526  
(202) 785-9700

Attorneys for Applicants

## APPENDIX A

Japanese patent application publication No. 56126916A by Akira: this published application generally relates to, inter alia, diffusing selenium with high accuracy into a chalcogenide with silver by use of photoresist and thermal treatment.

\*Axon Technologies Corp., *Technology Description: Programmable Metallization Cell*: this believed publication generally relates to, inter alia, use of chalcogenides doped with metal such as silver or copper to create solid state switch with lower voltage requirement.

Helbert et al., SPIE Vol. 333 Submicron Lithography (1982): this publication generally relates to, inter alia, hybrid ultragraphic process using both electron beam and conventional optical exposure within the same device level with a photoresist.

Hilt, dissertation (1999): this publication generally relates to, inter alia, stability of chalcogenides such as  $Ge_xSe_{1-x}$  with Ag doping by photodissolution and thermal diffusion.

Hirose et al., Phys. Stat. Sol. (1980): this publication generally relates to, inter alia, switch and memory phenomena in amorphous  $As_2S_3$  with photo-doped Ag, including new mechanism, electrical reliability, rapid memory performance, thermal characteristics and durability.

Holmquist et al., 62 J. Amer. Ceram. Soc., No. 3-4 (March-April 1979): this publication generally relates to, inter alia, reactions and diffusion of Ag in arsenic chalcogenide glass below the glass transition temperature, including solubility information and concentration dependence of Ag diffusion in these glasses.

Huggett et al., 42 Appl. Phys. Lett., No. 7 (April 1983): this publication generally relates to, inter alia, reactive sputter etching to develop silver-sensitized  $Ge_xSe_{1-x}$  photoresist.

Kawaguchi et al., 164-166 J. Non-Cryst. Solids (1993): this publication generally relates to, inter alia, deposition mechanism of Ag particles on Ag-rich Ag-As-S glass from a view-point of electrical effects.

\*Kolobov and Elliott, Advances in Physics (1991): this publication generally relates to, inter alia, photodoping (photodiffusion/photodissolution) of amorphous chalcogenides by metals, particularly silver.

\*Kozicki et al., Superlattices and Microstructures, 27 (2000): this publication generally relates to, inter alia, solid solutions of metals (e.g., silver) in arsenic trisulfide and their physical and electrical characteristics.

\*Kozicki et al., Microelectronic Engineering, vol. 63/1-3 (2002): this publication generally relates to, inter alia, the photodiffusion of Ag into germanium selenide glass films, the amount of Ag that can be incorporated in to such a film by photodiffusion, and the characteristics of the resulting doped films.

\*Kozicki et al., Proceedings of the 1999 Symposium on Solid State Ionic Devices (1999): this publication generally relates to, inter alia, physical and electrical characteristics of metal doped chalcogenide films (photodoped  $Ag_4As_2S_3$ ) between electrodes, useful in memories, configurable connections, and self-repairing interconnections.

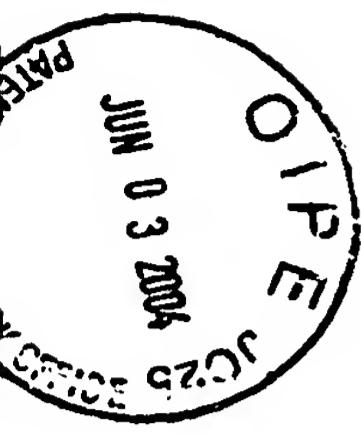
\*Kozicki and Mitkova, Proceedings of the XIX International Congress on Glass, Society for Glass Technology (2001): this publication generally relates to, inter alia, the physical effects of introduction of Ag into chalcogenide glasses, where introduction is by photodiffusion.

McHardy et al., 20 J. Phys. C.: Solid State Phys. (1987): this publication generally relates to, inter alia, sensitivity and high resolution of metals in amorphous chalcogenides by electron and UV radiation.

Owen et al., Nanostructure Physics and Fabrication (1989): this publication generally relates to, inter alia, photo-induced structural or physico-chemical changes of amorphous chalcogenides when exposed to light/irradiation, affecting chemical solubility.

Shimizu et al., 46 B. Chem Soc. Japan, No. 12 (1973): this publication generally relates to, inter alia, electric conductivity increase by increasing Ag-photodoping of chalcogenide glass.

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## INFORMATION DISCLOSURE STATEMENT BY APPLICANT

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Sheet 1 of 4 Attorney Docket Number M4065.0479/P479

U. S. PATENT DOCUMENTS					
Examiner Initials*	Cite No. <sup>1</sup>	Document Number	Publication Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Document	Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear
		Number-Kind Code <sup>2</sup> (if known)			
AA		6,469,364	10/2002	Kozicki	
AB		2002/0168820 App.	11/2002	Kozicki	
AC		2000/0072188 App	6/2002	Gilton	
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Sheet	2	of	4	Attorney Docket Number	M4065.0479/P479
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of

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Complete if Known	
Application Number	10/076,486
Filing Date	February 19, 2002
First Named Inventor	Stephen L. Casper
Art Unit	2818
Examiner Name	M. Tran
Attorney Docket Number	M4065.0479/P479

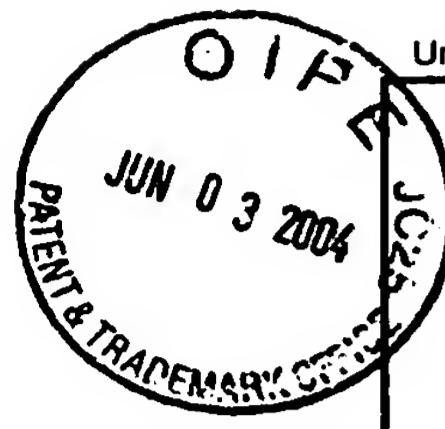
### FOREIGN PATENT DOCUMENTS

Examiner Initials*	Cite No. <sup>1</sup>	Foreign Patent Document	Publication Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Document	Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear	T <sup>6</sup>
		Country Code <sup>3</sup> -Number <sup>4</sup> -Kind Code <sup>5</sup> (if known)				
BA	JP 56126916		10/1981	Akira et al.		
BB						

Examiner Signature	Date Considered
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<sup>1</sup> Applicant's unique citation designation number (optional). <sup>2</sup> See attached Kinds Codes of USPTO Patent Documents at [www.uspto.gov](http://www.uspto.gov) or MPEP 901.04. <sup>3</sup> Enter Office that issued the document, by the two-letter code (WIPO Standard ST.3). <sup>4</sup> For Japanese patent documents, the indication of the year of the reign of the Emperor must precede the application number of the patent document. <sup>5</sup> Kind of document by the appropriate symbols as indicated on the document under WIPO Standard ST. 16 if possible. <sup>6</sup> Applicant is to place a check mark here if English language Translation is attached.



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Substitute for form 1449B/PTO		<b>Complete If Known</b>	
		Application Number	10/076,486
		Filing Date	February 19, 2002
		First Named Inventor	Stephen L. Casper et al.
		Group Art Unit	2818
		Examiner Name	M. Tran
Sheet	4	of	4
		Attorney Docket Number	M4065.0479/P479

## OTHER PRIOR ART – NON PATENT LITERATURE DOCUMENTS

Examiner Signature		Date Considered	
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